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TOWN OF KEEWATIN - DISTRICT OF KENORA

DARLINGTON BAY and PORTAGE BAY

POLLUTION COMPLAINT

Sanitary Engineering Branch

Summer & Fall - 1973

The Honourable
James A. C. Auld
minister

Everett Biggs
deputy minister

Ministry
of the
Environment

Ontario

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TABLE OF CONTENTS

DESCRIPTION PAGE

Introduction 1

Report Summary 1

Flow Patterns of Watercourses 3

Domestic Sewage Facilities - Town of Keewatin 3

Water Supplies - Town of Keewatin 5

Provincial Water & Sewage Projects 5

Outflows from Portage Bay 5

Field Investigations 6

Analytical Results

Biological 7

Chemical 7

Bacteriological 9

Discussion 11

Conclusion 12

Recommendations 12

APPENDICES

APPENDICES	NUMBER
Portage Bay, Darlington Bay Sketch	I
Portage Bay - Outflows, Table 1968-1973	II
Portage Bay - Outflows Graph	III
Town of Keewatin - Scum Analyses	IV
Town of Keewatin - Bottom Sediment Analyses	V
Keewatin - Watercourse Analyses, June 11/73	VI
Keewatin - Watercourse Analyses, Oct. 29/73	VIII

Ontario

Ministry of the
Environment

MUNICIPALITY: Town of Keewatin District of Kenora

DATE OF INSPECTION: Summer & Fall - 1973

RE: Town of Keewatin - Darlington Bay & Portage Bay - Pollution Complaint

FIELD INSPECTION BY: W.J. Grobelny

REPORT BY: W.J. Grobelny

INTRODUCTION

In the latter part of August 1972, a complaint received by the Ministry of Natural Resources from Mr. R. Campbell regarding a pollution problem in Darlington Bay was referred to the Ministry of the Environment for further comments. Several residents on Darlington Bay complained about scum accumulations and high coliform counts in the Bay and adjacent to various areas of shoreline.

REPORT SUMMARY

The problem regarding scum accumulation which occurred in Darlington Bay 1972 was attributed to decomposing algae which was present due to natural and artificial causes. The Lake of the Woods is an eutrophic lake and algae blooms recur on a yearly basis. Algae blooms are more intense in the Portage Bay area probably due to the artificial input of nutrients from the Keewatin area.

It is anticipated that the Provincial sewage works scheme will begin to be constructed in 1975 unless unforeseen circumstances are encountered. When this project is operational, the artificial nutrient input to Portage Bay should be substantially reduced.

At the present time only one outflow is utilized, located at the west end of Portage Bay. Previously two and three outlets were available to drain Portage Bay. Mills C and A raceway have been closed

..2

and the Ministry of Natural Resources presently operates a boat crane lift at mill A raceway to effect watercraft transfer from the Lake of the Woods into Darlington Bay. In order to reduce the possibility of any deterioration of the water quality in the west end of Darlington Bay, it is recommended that consideration be given to the provision of a second outflow from Portage Bay into Darlington Bay, preferably at one of the old outlet points.

..3

FLOW PATTERNS OF WATERCOURSES

During the past year, the two outlets referred to as mill raceways were closed. A coffer dam was constructed at mill C raceway and a boat crane is now utilized at mill A raceway. The Ministry of Natural Resources constructed the dam and operate the crane. Flows from Portage Bay are now channelled through the west end of Portage Bay, through Mink Bay and a tunnel underneath the Canadian Pacific Railway into the west end of Darlington Bay which flows into the Winnipeg River (Appendix I demonstrates the flow patterns). Environment Canada and the Lake of the Woods Control Board monitor the outflow at the west end of Portage Bay and generally, the average flows are maintained at 100 cubic feet per second.

DOMESTIC SEWAGE FACILITIES - TOWN OF KEEWATIN

There is no communal servicing in the Town of Keewatin. Three storm sewers are located within the Town which discharge into Portage Bay at Marr's Marine, Main Street Bridge and east of the Curling Rink. (Reference can be made to Appendix I). Sewage from the Powell business and apartment area is chlorinated prior to discharge into the Main Street storm sewer. Reportedly, there are other similar residential connections to the storm sewers as well.

The Municipal office and hotel are served by a common tile field and the Bay City Hotel, Curling Club and laundromat are serviced by individual septic tank and tile field systems. However, considering such conditions as rock formations and shallow overburden, the efficiencies of the aforementioned systems are questionable.

..4

Mr. A. H. Mason, Chief Public Health Inspector for the Northwestern Health Unit was contacted and apparently no records are available for these systems. It was also suggested by Mr. Mason that the standards for subsurface systems have changed considerably in recent years,and it is assumed that the existing septic tank systems would be considered inadequate in light of these modern standards.

All the residences are served by individual systems within the Town of Keewatin and the problem of inadequate services are not only confined to the commercial establishments. Complete sewer servicing would alleviate the sewage problems in the Town of Keewatin and with the possibility of a Provincial sewage scheme becoming available in the near future, the Northwestern Health Unit is reluctant to enforce corrective measures.

The Private Waste & Water Management Branch, Ministry of the Environment, has conducted a cottage pollution control program in a section of the Lake of the Woods area during the summer of 1973. The shoreline residences along Keewatin Beach were evaluated as well as five residences along the south shore of Portage Bay between the beach and the Main Street bridge. Apparently, minor problems including sink and laundry waste discharges were encountered and abatement procedures have been implemented to correct these problems. It should be pointed out that only a small number of homes were inspected although the residential development near the watercourse is fairly dense. This concentrated development is situated in terrain consisting generally of rock formations and shallow overburden which is not conducive to the satisfactory operation of subsurface sewage systems. It is felt that eventually, drainage from the concentrated development areas would reach Portage Bay.

WATER SUPPLIES - TOWN OF KEEWATIN

Most commercial establishments and a large number of residents along the shoreline of the Town of Keewatin utilize Portage Bay as a source of water both on a permanent and temporary (summer use) basis. Many of the residents utilize the Portage Bay source during the summer months and convert to cisterns during the cold weather months. The Town of Keewatin provides water and a tanker truck service for its consumers. The Health Unit advises the individual consumers to disinfect their drinking water supplies if Portage Bay is utilized as a source of water. It is also a Provincial requirement that all surface waters used for domestic purposes should be disinfected prior to consumption.

PROVINCIAL WATER AND SEWAGE PROJECTS

Provincial water and sewage works projects are being developed for the Town of Keewatin by the Ministry of the Environment. All the preliminary aspects of the projects have now been completed and the proposals are now being reviewed by the Ontario Municipal Board. Advertising procedures have been implemented and the final design stage should be completed within several months. It is hoped that construction will commence in the spring of 1975.

OUTFLOWS FROM PORTAGE BAY

The Inland Waters Branch of the Federal Department of the Environment monitors the outflows from Portage Bay into Darlington Bay. The location of the outflows can be found in Appendix I. The Lake of the Woods Control Board regulates the lake levels while the Ministry of Natural Resources controls the overflow into Mink Bay.

The average daily outflow, in cubic feet per second, is summarized in Appendix II. These data are also demonstrated in graphical

..6

form in Appendix III. The summarized data represents the information collected during the period January 1968 to December 1973.

Prior to November 1970, mill C and A raceways were utilized as outflows from Portage Bay. From November 1970 to May 1972 an additional outflow was located at the west end of Portage Bay. During the time when these outlets were utilized the outflow from Portage Bay averaged approximately 300 cubic feet per second each day. The main outlet was mill C raceway. The actual data can be found in Appendix II but is shown graphically in Appendix III. In May 1972 mill A raceway was closed and the west end of Portage Bay was the only remaining outlet. The average outflow from this location has been approximately 100 cfs.

Originally, the two raceways were utilized to generate power to service local industries; however, this is no longer the case. The raceways also served the secondary purpose of providing an outlet from Portage Bay which is a relatively stagnant body of water. It was felt that a discharge point located at the west end of Portage Bay would be sufficient to prevent stagnant conditions in the Bay and for this reason the two raceways were closed.

Based on the information available, the total outflow from Portage Bay since the late summer of 1972 has been decreased to approximately one third when compared to the period prior to that date. In fact, there has been no significant increase in the volume of water discharged to Mink Bay since mills A and C were closed.

FIELD INVESTIGATIONS

On August 21, 1972, several residents in the Darlington Bay area complained about accumulations of scum material along the

..7

shoreline in several locations. Subsequently, investigations were carried out by Ministry staff on August 21 and 28, September 12, 13, 27 and 28, 1972. Samples were also collected on June 11, August 15 and October 29, 1973, to monitor the water quality. The sample results will be discussed under "Analytical Results". It should be noted that the complaint was received only after the two raceways were closed and the discharge from Portage Bay all went through Mink Bay.

ANALYTICAL RESULTS

Biological

On August 21, 1972, samples of the scum accumulation were collected and submitted to the Ministry of the Environment Laboratories in Thunder Bay and Toronto for chemical analyses and biological examination. The results of the chemical samples can be found in Appendix IV. The results indicated a highly organic decomposed material with high nutrient values.

A microscopic examination of the material was carried out and following are the comments of the Biology Section of the Ministry of the Environment:

> "Microscopic examination revealed the following organisms in order of dominance: Aphanizomenon, Oscillatoria, Lyngbya, Anabaena and Microcystis - all blue green algae. The milky colour was due to decomposition of a fresh water Bryozoa; Chara and branched filamentous algae was also present".

Anabaena is a frequent component of nuisance algae blooms and under favourable conditions becomes over abundant. The cells have gas vacuoles which cause the algae to float high in the water where it forms a surface scum. Therefore, it appears that the blue green algae was a factor in the formation of the scum accumulations. Blue

..8

green algae blooms have been common in the Lake of the Woods.

On September 13 and 28, 1972, samples of the bottom sediment were collected in Portage Bay and Darlington Bay. The results of these samples can be found in Appendix V. On September 28, 1972, a representative of the Biology Branch assisted with the sampling and apparently the bottom sediments were typical of river or lake bottom growth and no signs of impairment were observed. The total solids analyses reveal generally that a low organic (loss) to inorganic (ashed) ratio was present. This suggests that the concentration of organic materials in the sediment was not excessive. At the location identified as Sea Cadet Bay, the organic values were higher when compared to the normal levels, however, this could be attributed to the bark encountered in the sediment at this location. These results indicate that large volumes of organic material are not accumulating on the bottom of Darlington Bay.

Chemical

The results of the chemical samples collected on June 11 and October 29, 1973, can be found in Appendices VI and VII. When comparing the two sets of sample results the values appear to be slightly higher in October. There was a slight increase in the Biochemical Oxygen Demand, nutrient levels and Chemical Oxygen Demand during the latter part of the year. These slightly increased levels may be attributed to decomposing algae at that time of the year. The highest levels were observed at the station below the laundromat (refer to Appendix VII). The increased levels at this location are probably attributable to indirect waste discharges from the laundromat into Portage Bay.

..9

Bacteriological

Following is a summary of the bacteriological samples collected on June 11, August 15 and October 29, 1973, and examined at the Public Health Laboratory in Kenora:

..10

Location	Date (1973)	Total Coliform Organisms*	Faecal Coliform Organisms*
Winnipeg R.-Norman Dam	June 10	66	0
	Aug. 15	38	8
Portage Bay - Keewatin Pumphouse	June 10	80+	0
	Aug. 15	80+	4
	October 29	104	0
Portage Bay-Main St. Dock	June 10	80+	0
	Aug. 15	74	4
	October 29	100	2
Portage Bay-below laundromat	Aug. 15	80+	80+
	October 29	2100	2100
Portage Bay-West End	June 10	80+	0
	Aug. 15	76	14
	October 29	400	16

*Count per 100 m.l.

The bacteriological sample results indicate that domestic sewage is gaining access to Portage Bay. The greatest incidence of faecal coliforms is located in the vicinity of the laundromat, however, the entire body of water is susceptible to domestic waste inputs to some degree.

DISCUSSION

The problem regarding scum accumulation which occurred in Darlington Bay in August 1972 was attributed to deteriorating and decomposing algae which was present due to natural and to a small degree, artificial causes.

During the surveys carried out in 1972 and 1973, heavy algae blooms were observed throughout Portage Bay, Lake of the Woods and Darlington Bay, especially during the latter part of the summer. This problem recurs on a yearly basis and the intensity of the bloom is dependent upon conditions such as water and air temperatures, water levels,to name a few. Algae is prevalent throughout the Lake of the Woods. It is felt that natural conditions are the major cause of algae blooms in the lake system. As mentioned previously there is domestic sewage gaining access into Portage Bay and it is felt that this artificial nutrient input is a minor contributing factor to the more intense algae growth. Once the Provincial sewage scheme is operational then the artificial input (domestic sewage) will be virtually removed from Portage Bay.

It is felt that some of the establishments in the Town of Keewatin would require improvements to the existing sewage disposal systems; however, as pointed out earlier, the Health Unit does not feel it is economically feasible to enforce interim corrective measures on such a short term basis when the Provincial sewage project could be a reality in the near future.

..12

CONCLUSIONS

At the present time, mills A and C raceways are closed and a boat crane lift is located at the A raceway to effect the transfer of watercraft from the Lake of the Woods to the Winnipeg River. One outflow is now located at the west end of Portage Bay and the water from this outlet flows into Mink Bay and eventually into Darlington Bay. The average daily outflow generally maintained is usually 100 cubic feet per second. Prior to May 1972, mill C was the main outflow from Portage Bay while mill A was a secondary outlet. For a period of time, Mink Bay (west of Portage Bay) was utilized as the third outlet for Portage Bay. When two and three outlets were utilized the total average outflow from Portage Bay approximated 300 cfs. With the one location now at Mink Bay, the total average outflow has been decreased by two-thirds while two separate discharge points were eliminated. A problem involving scum accumulation in Darlington Bay was first noticed during the late summer of 1972. The Mink Bay outlet was utilized before this time; however, the main outflow (mill C) had been closed. It cannot be determined whether a recurrence will take place but as a preventative measure, consideration should be given towards utilizing a secondary outlet, more preferably mill C raceway, at least until such time as the Provincial sewage works is operational.

RECOMMENDATION

It is recommended that consideration be given towards the provision of a secondary outflow from Portage Bay into Darlington Bay.

Prepared by: J.D. Stasiuk
for W. J. Grobelny
Sanitary Engineering
Branch

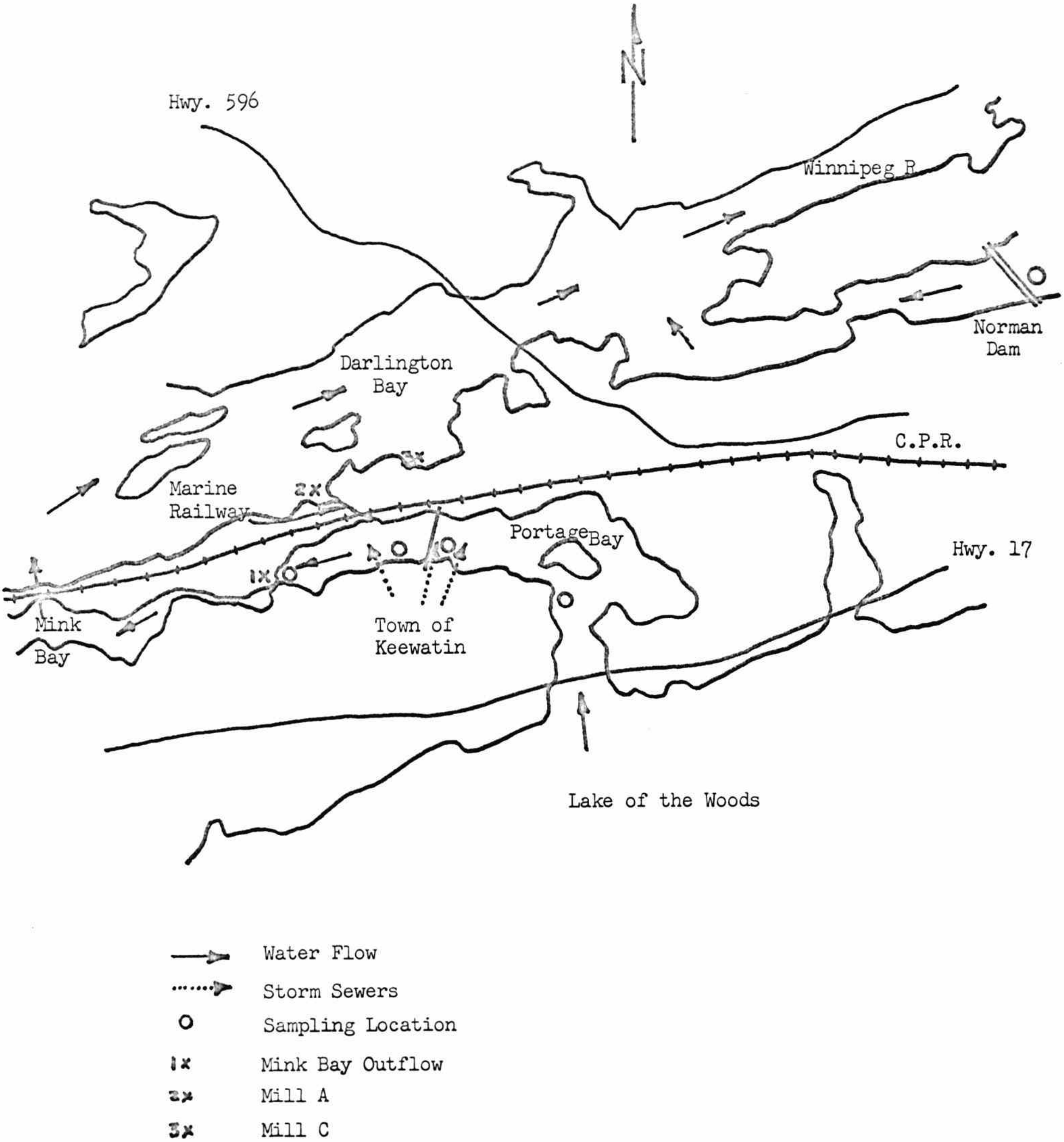
WJG:JDS:sn

TOWN OF KEEWATIN

PORTAGE BAY & DARLINGTON BAY AREA

FLOWS, SAMPLING LOCATIONS

APPENDIX I

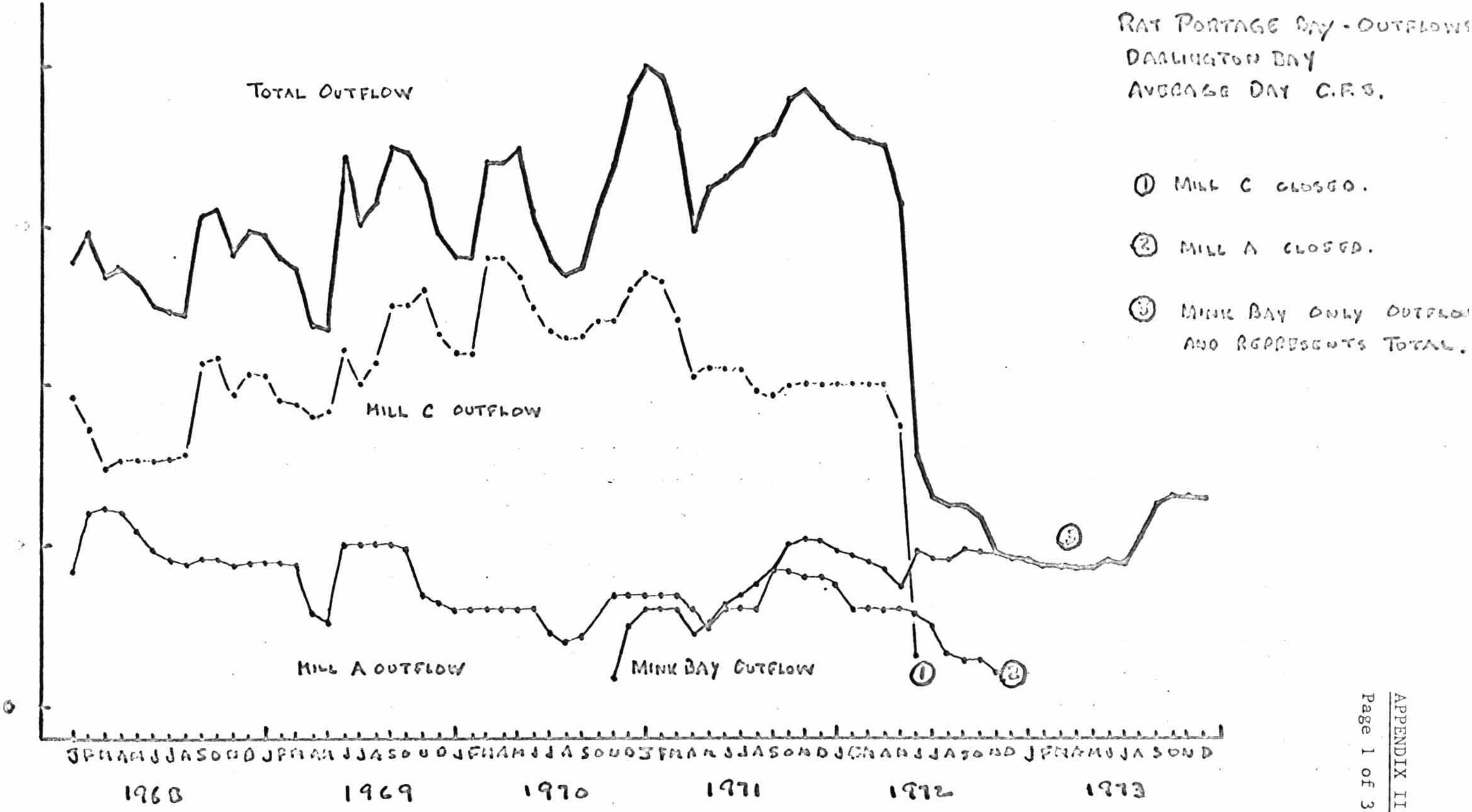


Rat Portage Bay - Outflows, Average day cfs

1968	Mill A	Mill C	Total
January	84	194	278
February	120	174	294
March	122	147	269
April	120	153	273
May	110	154	264
June	97	154	251
July	91	155	246
August	87	157	244
September	92	215	307
October	92	218	310
November	87	194	281
December	89	207	296
Average	99	177	
1969			
January	90	205	295
February	90	190	280
March	87	187	274
April	58	180	238
May	53	183	236
June	100	222	322
July	100	200	300
August	100	216	316
September	100	250	350
October	97	251	348
November	70	260	330
December	63	232	295
Average	84	214	298

1970	Mill A	Mill C	Mink Bay	Total
January	60	220		280
February	60	220		280
March	60	280		340
April	60	280		340
May	60	268		348
June	60	250		310
July	44	235		279
August	40	230		270
September	43	233		276
October	70	240		310
November	70	240	19 (part month)	339
December	70	260	51	381
Average	58	246		313
1971				
January	70	270	60	400
February	70	264	60	394
March	60	240	60	360
April	48	205	44	297
May	60	210	52	322
June	60	210	61	331
July	60	210	68	338
August	83	196	76	355
September	82	193	83	358
October	80	200	100	380
November	80	200	103	383
December	74	200	99	373
Average	69	216	72	357

1972	Mill A	Mill C	Mink Bay	Total
January	60	200	101	361
February	60	200	96	356
March	60	200	94	354
April	60	200	90	350
May	58	174	84	316
June	50	32 (closed)	75	157
July	34	—	97	131
August	30	—	93	123
September	30	—	92	122
October	21 (closed)	—	97	118
November	—	—	95	95
December	—	—	93	93
Average	46	168	92	214
1973				
January	(closed)	(closed)	91	91
February			86	86
March			85	85
April			83	83
May			85	85
June			89	89
July			88	88
August			104	104
September			125	125
October			131	131
November			131	131
December			130	130
Average			102	


RAT PORTAGE BAY - OUTFLOWS
DARLINGTON BAY
AVERAGE DAY C.F.S.
① MILL C CLOSED.
② MILL A CLOSED.
③ MINK BAY ONLY OUTFLOW AND REPRESENTS TOTAL.
TOTAL OUTFLOW
MILL C OUTFLOW
MILL A OUTFLOW
MINK BAY OUTFLOW
①
②
③
0
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1968
1969
1970
1971
1972
1973

MINISTRY OF THE ENVIRONMENT

CHEMICAL LABORATORIES

APPENDIX IV

~~SEWAGE ANALYSIS~~

RIVER SURVEY

All analyses except pH reported in mg/litre unless otherwise indicated

Municipality: Town of Keewatin

Report to: W. Grobelny

c.c. G. Quance ~~Supervisor of Sewage Works~~
Central Files – circulate
to W.Q.B.
Dist. Eng.

/dl

Source: Unknown

Program: Complaint

c.c. JRM
TBRO

Date Sampled: Aug. 21/72 **by:** Various

Lab. No.	5-Day B.O.D.	Susp. Solids	Solids Total		NITROGEN AS N – Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	PHOSPHORUS AS P Tot.	Sol.	Phenols* in PPB		
R633			2930	Dried		260.			7.0		15		
			290	Ashed									
			2640	Loss									
R634			12800	Dried		1100.			26.				
			1840	Ashed									
			10960	Loss									
R635			4760	Dried									
			610	Ashed									
			4150	Loss		400.			12.				

* On filtered sample only

R633	2	Marchants Island
R634	3	Duffus – Darlington Bay
R635	4	Walkers Island

Note: Samples also sent to Toronto Lab. for identification purposes

MINISTRY OF THE ENVIRONMENT
CHEMICAL LABORATORIES
SEWAGE ANALYSIS

APPENDIX V

All analyses except pH reported in mg/litre unless otherwise indicated

Municipality: Town of Keewatin

Report to: J. R. Marsh
T.B.R.O.

c.c. G. Quance
~~Supervisor of Sewage Works~~
Central Files -circulate
to H. Browne
W.Q.B.

Source: Darlington Bay at Rat Portage Bay

c.c. W. J. Grobelny
K.D.O.

Date Sampled: Sept. 28/72 **by:** W.J.G.

RF /dl

Lab. No.	5-Day B.O.D.	Susp. Solids	Total Solids		NITROGEN AS N - Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	PHOSPHORUS AS P Tot.	Sol.			
808			168,000	Dried									
			138,000	Ashed									
			30,000	Loss									
809			934,000	Dried									
			875,000	Ashed									
			59,000	Loss									
810			171,000	Dried									
			147,000	Ashed									
			24,000	Loss									
811			145,000	Dried									
			115,000	Ashed									
			30,000	Loss									

Lab. No.	Total Solids	
812	140,000	Dried
	103,000	Ashed
	37,000	Loss
813	174,000	Dried
	147,000	Ashed
	27,000	Loss
814	295,000	Dried
	258,000	Ashed
	37,000	Loss

808	Darlington Bay - Bottom Sediment - Marchand Island
809	Darlington Bay - Bottom Sediment - Duffus
810	Darlington Bay - Bottom Sediment - Rice Plant
811	Darlington Bay - Bottom Sediment - Mink Bay Outlet
812	Rat Portage Bay - Bottom Sediment - West of Bridge
813	Rat Portage Bay - Bottom Sediment - East across Marrs'
814	Rat Portage Bay - Bottom Sediment - Bridge @ Main St. Outfall

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MINISTRY OF THE ENVIRONMENT

CHEMICAL LABORATORIES

~~SEWAGE ANALYSIS~~

RIVER SURVEY

APPENDIX VI

All analyses except pH reported in mg/litre unless otherwise indicated

Municipality: Kenora-Keewatin

Report to: Environment - San. Eng.

c.c. ~~Supervisor of Sewage Works~~
Central Files
RF
Reg. Eng.

Source: Watercourses as below

Date Sampled: June 11/73 **by:** W. J. Grobelny

/dl

Lab. No.	5-Day B.O.D.	Turbidity ~~Susp. Solids~~ F.T.U.	C.O.D.	Chloride	NITROGEN AS N -				PHOSPHORUS AS P		pH at Lab	Conductivity in Micromhos
					Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	Tot.	Sol.		
R524	0.8	0.85	25	<1	.03	.29	.003	<.01	.008	.004	7.7	104
R525	0.8	1.3	15	<1	.02	.52	.003	<.01	.022	.003	7.6	106
R526	1.0	1.4	20	<1	.03	.53	.003	<.01	.022	.005	7.5	109
R527	0.6	1.5	20	<1	.03	.53	.003	<.01	.028	.019	7.6	108

* LOW VALUES ARE RELIABLE TO ± .002 PPM

R524	Winnipeg Rat Norman Dam (Duplicate)
R525	Portage Bay at Keewatin Pump House (Duplicate)
R526	Portage Bay at Main St. dock
R527	Portage Bay at West End Gate

MINISTRY OF THE ENVIRONMENT
CHEMICAL LABORATORIES
River Survey

APPENDIX VII

All analyses except pH reported in mg/litre unless otherwise indicated

Municipality: Town of Keewatin

Report to: Reg. Eng.

c.c. Supervisor of Sewage Works
Central Files
R.F.

/dl

Source: Rat Portage Bay

Date Sampled: Oct. 29/73 **by:** W. J. Grobelny

Lab. No.	5-Day B.O.D.	Turbidity Units	C.O.D.	Chloride as Cl	NITROGEN AS N -				PHOSPHORUS AS P		pH at Lab.	Conductivity in Micromhos	
					Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	Tot.	Sol.			
911	1.2	1.8	<10	<1	.02	.52	.004	.02	.037	.007	7.1	103	
912	1.0	1.6	<10	<1	.02	.55	.005	.03	.039	.007	7.4	104	
913	1.4	1.8	<10	<1	.01	.55	.011	.02	.053	.017	7.5	105	
914	1.2	1.5	<10	<1	.02	.52	.005	.02	.039	.012	7.6	104	

*Low values are reliable to ± .002 ppm

911	Keewatin - Portage Bay at pumphouse (duplicate)
912	Keewatin - Portage Bay at Main Street (duplicate)
913	Keewatin - Portage Bay below Laundromat (duplicate)
914	Keewatin - Portage Bay at west end (duplicate)

MINISTRY OF THE ENVIRONMENT
CHEMICAL LABORATORIES
SEWAGE ANALYSIS

All analyses except pH reported in mg/litre unless otherwise indicated

Municipality: Town of Keewatin

Report to: J. R. Marsh
T.B.R.O.

c.c. G. Quance ~~Supervisor of Sewage Works~~
Central Files -circulate
to H. Browne
W.Q.B.

Source: Darlington Bay

Date Sampled: Sept. 13/72 **by:** W.J.G.

RF /dl

Lab. No.	5-Day B.O.D.	Susp. Solids	Total Solids		NITROGEN AS N -				PHOSPHORUS AS P				
					Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	Tot.	Sol.			
815			103,000	Dried									
			79,000	Ashed									
			24,000	Loss									
816			36,600	Dried									
			29,400	Ashed									
			7,200	Loss									
817			114,000	Dried									
			92,800	Ashed									
			21,200	Loss									
818			82,100	Dried									
			43,700	Ashed									
			38,400	Loss									
819			362,000	Dried									
			341,000	Ashed									
			21,000	Loss									

815	1	Darlington Bay - Bottom Sediments - Mink Bay Tunnel
816	2	Darlington Bay - Bottom Sediments - West End
817	3	Darlington Bay - Bottom Sediments - North side across from Mink Bay Tunnel
818	4	Darlington Bay - Bottom Sediments - Sea Cadet Bay
819	5	Darlington Bay - Bottom Sediments - Pipeline Bay